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$3 PER ANNUM
IN ADVANCE.

Towle's Grade and Drainage Level.

This is a neat, durable and simple instrument, which is intended to meet the wants of the student and the practical Surveyor as well. It is also adapted (owing to its simplicity) to the use of the novice, or any one who desires to work it. To this end the inventor supplies a pamphlet, with full instructions, with each machine. The illustration herewith, gives a clear idea of its construction. To make its operations perfectly plain the following example is given:

TOWLE'S GRADE AND DRAINAGE LEVEL.

Problem.—To set a number of stakes or pegs in the ground, to define the surface of a proposed concrete floor for instance, so that their top ends shall be in the same horizontal plane—and at the same time so that all the pegs shall be of the same level as some other peg, marked A:

1st. Erect the instrument and level it nearly over peg A; measure with a rod (a pine stick 1 inch square and about 8 feet long, will do very well) from the peg A, up to line of sight, and put a small nail or pin at that height, into the rod, for a mark to sight at.

2d. Now proceed to drive another stake, B, wherever desired, and turn the instrument on its ball and socket joint, to bring the line of sight to bear upon the rod, when placed and held by an assistant, upon this stake. The bubble, after being brought to the centre again, will readily indicate whether the line of sight, which will then be horizontal, strikes above the mark or nail on the rod, or not; if it strikes above the mark on the rod, the assistant must drive the stake gradually, till the mark exactly corresponds with the line of sight—when it will be in the plane of the level—and then, inasmuch as the top of both stakes (A and B) are the same distance below the plane of the level, they are themselves in the same horizontal plane. In a similar manner proceed to place as many other stakes as may be required.

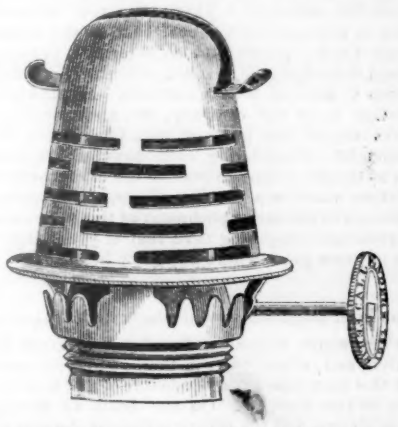
With this instrument can be laid out the proper grades for drains, ditches, roadways, etc., and the proper levels for foundations of houses, bridges, concrete floors, artificial ponds, etc. In fact, all sorts of general grading and levelling may easily and readily be done by any one who understands the principles of a common carpenter's or mason's level.

For further information see advertisement on page 25. Address Hamilton E. Towle, Civil Engineer, No. 176 Broadway, Rooms 26 and 28, N. Y. City.

The Callender No-Chimney Lamp Burner.

Next to gas, petroleum or coal oil is the element which, at the present day, furnishes the cheapest and most satisfactory artificial light. Lamps, burners, and apparatus for burning coal oil have received the special attention of inventors for the last ten years; and probably more patents have been granted for improvements in Lamps and lamp burners during that time, than any other line of invention.

Owing to the numerous accidents attended with loss of life and property, arising from the explosive nature of the oils vended in market, it has become a matter of great importance to produce a burner that will not conduct heat from the flame to the fountain or receptacle containing the oil. This will be more obvious when it is stated that, contrary to general belief, the oil never explodes, but it is the admixture of the volatile vapors of the oil with the atmosphere in the lamp, that produces the explosion. Now, good oil at ordinary temperature, should not give off vapor; yet if the lamp be heated the oil will evolve the vapor, so dangerous and so dreaded. By keeping the lamp cool this evil is overcome. This object is attained in the "Callender Burner," shown in the accompanying engravings.



The peculiar feature or principle in this burner consists, as fully shown in the larger cut, in so stamping the metal composing either the cone or base of the burner, that the metallic communication is greatly lengthened, without necessarily increasing the hight of the burner. It will be seen the perforations "break joints," so the heat has to travel *around* every slot on its way to the lamp. The distance is thus made so great, that the heat becomes dissipated before it reaches the lamp oroil below.

HAND LAMP.

A metalic strip or bridge is adjusted across the burner a trifle above the top of the wick tube, and is perforated so the wick can pass up through it. The base of the flame rests on the bridge and does not touch the top of the wick-tube as usual. This serves to keep the wick-tube cool and the wick from charring.

These burners are very much liked, and are the best adapted for safety and to burn without a chimney, of any burner yet invented. For hand lamps, lanterns and the like they are invaluable.

Messrs., Holmes, Booth & Haydens, No. 51 Chambers street, N. Y., manufacture these burners, and supply the trade both here and in Europe.

Chemical Repertory.--No. 22.

JANUARY 17, 1870.

Editor—HENRY WURTZ.

Editorial.

I have examined critically, as a Scientific and Practical Chemical Expert, into the workings of a novel and remarkable process and apparatus for extracting sulphur, from materials which contain it, by the agency of Superheated Steam; and, having watched the operation for several months, I am now ready to present the views that I have been led to form.—H. W.

INTRODUCTORY.

Some preliminary considerations need little more than mention, to be appreciated; such as the fundamental and increasing importance of sulphur, as a material in manufactures; the fact that all our sulphur is imported from abroad; the necessity therefore of developing native sources, of which we have abundance undeveloped; and so on.

It is apparent to all men of practical science, that the most valuable sources of sulphur (as of all other materials, whenever such sources are, in the nature of things, practicable) must be from waste or effete products of other industries; as, for example, in the case of ammonia from gas-liquor, acetic acid from the charcoal manufacture, bromine and iodine from salt-spring bitterns, potash from sea-water bitterns, paraffine from gas tar and petroleum-residues, and other similar and familiar cases too numerous to mention.

These considerations have led the author of this invention, who is well known as a practical chemist of this city, Mr. S. R. DIVINE, to experiment especially upon the effete material proceeding from the use of Oxide of Iron as a purifying agent in Gas Works, which has become so highly charged with sulphur, by dint of repeated use, as to be no longer serviceable. His apparatus has therefore been erected at the corner of 21st Street and Avenue A, in immediate proximity with the Station of the NEW YORK GAS-LIGHT CO., who have now been using successfully for two years an improved form of the Iron Process.

The resort to this material as a source of sulphur, is justified by the most reasonable and practical views of scientific economy. There is more unoxydized sulphur in coal, even in gas coal, than in any other raw material that we operate with, considering it *in the aggregate*; and this sulphur is now but an obstacle, a nuisance, and even a cause of heavy expense. Mr. DIVINE, by converting it, on the contrary, into a source of profit, achieves one of the greatest triumphs of the industrial chemist. Considering, even beyond this, that his aim is at the same time to restore the effete material to its pristine value as a purifier of gas, it is apparent that success in the accomplishment of this is an achievement even more imposing than that of "making two blades of grass grow where one grew before."

CALCULATIONS.

Some brief calculations will illustrate this:

The aggregate annual make of gas in New York, Brooklyn, and other cities in this vicinity, cannot be less at this time than 4,000,000,000 feet, and is of course rapidly on the increase. On the basis of the figure given in CLEGG and the other text-books, for the average proportion of sulphur (as sulphuretted hydrogen) in the crude unpurified gas, namely 25 feet per 1000 feet, the total of sulphur that is extracted from the above, in its purification, and which now goes entirely to waste, exceeds 4,200 tons; nearly the whole of which should be converted, by the proposed new system of operation, from a nuisance into an article of profit, and a staple material of the greatest importance. As to the amount of profit that may be reasonably anticipated in this way, some idea may be formed, even in the present incipient stage of the enterprise; when we consider that the value, as a gas-purifier, which is at the same time given to the almost valueless material proposed to be operated on (a point which has been most satisfactorily settled on a working scale by actual experiments) should balance, at least partially, the expense of the operation. Four thousand tons of sulphur, in a crude state, suitable for making sulphuric acid, may be assigned a market value at present in New York of about a quarter of a million dollars.

IMPROVEMENTS IN THE IRON PROCESS.

The very frequent and prolonged observations and examinations, that I have been enabled to make, during the past summer and autumn, of the operations of the New York Gas-Light Company, have shown me that the improvements recently introduced by the skilful officials of that Company, into the working of the Iron Process of Purification, are of the greatest importance. These improvements, so far effected, relate to safety, together with power and rapidity, and therefore economy, of operation; and investigations now in progress promise to remove the last of the objections that have been held against Oxide of Iron purification, on general grounds. This is not the place for me to enter upon these. It is sufficient to say that it is now obvious to me the one thing needful to bring this system of purification almost to what may be called Industrial Perfection, is the introduction of such means as now proposed, of recovering the sulphur and at the same time restoring the purifying power to the iron.

DIFFICULTIES.

The problem is one of much inherent difficulty, in the eyes of a chemist, inasmuch as it has been believed that the extraction of the sulphur must be effected at temperatures which will not expel the combined water of the hydrated oxide of iron.

The use of *solvents*, which has been proposed and highly thought of by some, in Europe, and is even now a subject of experiment there—if otherwise unobjectionable, would depend for success upon the perfecting of exceedingly cheap means of extracting *completely* from the residual oxide the heavy hydrocarbon oils proposed to be used; as the retention of these in the mass would destroy its usefulness as a purifier. Such means have not been indicated, so far as I know.

It is easy therefore for a chemist to appreciate the considerations which have led this inventor, Mr. DIVINE, to the use of *superheated steam* as a medium through which to distil off the sulphur with the least liability of producing such molecular change as to diminish the activity and facility of the reaction between the Iron-Oxide and the sulphide of ammonium of the crude gas—a reaction upon which, as my own chemical researches have indicated, the action and efficiency of the oxide as a purifier is chiefly dependent. Another important practical point may be here brought in. This is that even were it possible, by simple distillation, to extract the sulphur, without injury to the residue, it would be hard to adapt apparatus composed of the only available material, iron. I have found that this material is far too rapidly attacked by melted sulphur, at heats at which the latter can be distilled. In an atmosphere of steam this does not appear to take place, a very remarkable fact, first developed by Mr. DIVINE.

I am enabled to state, in this connection, that the problem of separating sulphur from certain other materials by distillation with superheated steam is one which had occupied my own attention in the laboratory before I became acquainted with Mr. DIVINE's plans; but, in consequence of the many practical difficulties found and foreseen by me in the application, I was obliged to abandon it. Several of the same difficulties incident in my own case have occurred here also, and I am therefore fully qualified to appreciate the ingenuity and pertinacity with which Mr. DIVINE has mastered them.

One of the chief of these difficulties arises from the fact that the temperature at which sulphur commences to volatilize with any rapidity, is in the immediate neighborhood of that at which it assumes a high degree of viscidity, such as to render the mass wholly impenetrable by steam and by its own vapor. Hence one of the main features of the new apparatus is the introduction into the still of revolving stirrers, attached to horizontal arms on a vertical axis, a plan which has proved perfectly successful, as regards conquering this difficulty.

MODE OF OPERATION.

For descriptions of the apparatus *in detail*, I must refer to the specifications of DIVINE's patents. A few points will suffice here. The superheater is of common construction; the retort a flat-bottomed, provided with stirrers as aforesaid, and protected by brick work ond otherwise from loss of heat by radiation. The steam with its contained sulphur-vapor, is condensed by passage into a large tank filled with water. The ordinary charge of the experimental retort already erected is 20 bushels (or about one ton) of the effete Iron-Oxide. The distillation of the sulphur from this charge requires about five hours, at temperatures (for the steam introduced) ranging from 400° to 500° Fahr. It is very interesting to observe that, even after the water first condensed in the mass has again been expelled, and the retort or still has reached the maximum temperature that can be imparted to its contents under the circumstances, it is found very difficult, for the first *hour and a half*, to raise the heat above 250°, indicating (after every allowance for escape by conduction and radiation) a continuous diminution of 150°, or more, of the temperature of the steam, in supplying its *latent heat of vaporization* to the sulphur.

(I would point out to chemists the excellent opportunity here presented to determine with precision, and on a large scale, this important constant, the latent heat of sulphur vapor; of which, after much search through the text books, I am unable to find a determination accurately made by direct experiment. I purpose to make some experiments on this point with DIVINE's apparatus at an early day.)

CONDENSATION.

After a certain lapse of time, averaging probably three hours, the water in the condensing tank, amounting in volume to some 600 cubic feet, or about 4,700 gallons, reaches the boiling point, and thereafter the pressure exerted upon the contents of the retort must be that of a column of water equal to the length of the dip-pipe in the condensing tank, about five feet; or say 3 lbs per square inch. This seems objectionable, as it must augment appreciably the vaporizing point of the sulphur, and therefore to an important degree the time of the distillation. A modification of the plan of condensation appears therefore to be indicated, unless it should be possible in practice to use a much larger volume still of cold water for condensation. It will be easy, however, I perceive, so to modify the plan that even a smaller volume than now used will do the work even more effectually.

CHARACTER AND QUALITY OF THE RESIDUAL PRODUCT.

An unexpected and remarkable phenomenon was manifested at first by the residue from this steam distillation, which threatened to defeat the whole undertaking, until overcome by the inventor's persistence. It would appear that there is left in the residue a small portion of some compound of iron and sulphur, which is in a *pyrophoric* condition; that is, which takes fire spontaneously on exposure to the air, evolving sulphurous acid gas in considerable amount. In operating on a large scale this would have constituted a nuisance, and an insuperable obstacle to the conduction of the process in a populous locality.

This difficulty, however, was very simply mastered. It was found necessary only to moisten the residual mass in the retort, after opening the latter, with water, before removing it into the open air. When the mass has once been moistened throughout, the pyrophoric character is lost.

With regard to this residue an essential inquiry now comes up; that is, whether there has been restored to the Iron-Oxide by this means an absorbent power for the hydrosulphate of ammonia of the gas, comparable with that of the original limonitic (Staten Island) ore employed? Laboratory experiments led me to anticipate confidently an affirmative reply to this question; but practical men will of course await the actual trial in the purifier.

I am happy to be able to state that this point has been conclusively established. The following statement regarding this was made at my request, by the gentlemen who are in immediate charge of the purifying operations of the New York Gas-Light Co., Mr. CARTWRIGHT being an Engineer of their Works.

NEW YORK, December 15, 1869.

Prof. HENRY WURTZ.

DEAR SIR: In answer to your request we beg to state in writing, that we have made a practical test in a gas purifier upon several bushels of the prepared Oxide of Iron, from which the sulphur has been extracted by superheated steam, and find that its action is as satisfactory, and its purifying power is as great as the original preparation. Our joint impression was that the candle power was even somewhat improved over the gas purified by it in its original condition.

WM. H. ST. JOHN,
PETER CARTWRIGHT.

I purpose again bringing forward this interesting subject in the Journal, as further developments may soon be expected.

HENRY WURTZ.

American Chemical News.

ORIGINAL COMMUNICATIONS.

SCIENTIFIC DISCUSSION AT THE NEW YORK LYCEUM OF NATURAL HISTORY.

Meeting of the Chemical Section; January 10, 1870.

In addition to the important papers of Mr. LOEW which we are enabled by favor of the author to present exclusively, an interesting discussion occurred on points connected with the *Chemical History of Minera Carbon-Compounds;* which discussion was initiated by the presentation of the following note. The reader of the note, who has twice before brought this subject before the LYCEUM, announced that it was again introduced *on this occasion* against his own wish and in deference to others, and that the Note itself was only to be regarded as preliminary to a more extended paper, and presented on this occasion partly *"pour prendre date."*

PRELIMINARY NOTE ON A NEW CHEMICAL THEORY OF COAL-GENESIS.

By Prof. HENRY WURTZ, of New York.

It cannot be denied that the indigenous apozoic products of those past geological epochs marked by the formation of true coal-beds, were seldom, probably never, of the *ltquid* consistence; but rather *solid* and *gaseous*. Also, that as to older rocks than the so-styled Carboniferous, both in Devonian and Silurian; while

these latter hold indigenous apozoic solids and gases, liquids also are common; and the same remark may be made regarding newer formations, as the Triassic (of Southbury, Connecticut), the Tertiary (of California, the Caspian, etc). The induction I draw, from these and many other considerations, though altogether at variance with the received popular view, is that Genesis of Apozoic Liquids (grouped together under the trivial name "Petroleum") has really been the rule and not the exception, the normal result of the processes of decay which have been prevalent in general; while, on the other hand, Coal-Genesis, or that of *insoluble oxygenated* apozoic minerals, has been exceptional or abnormal, a result of the concurrence of conditions which were exceptional, occasional, or but local. It is to this point that my inquiries have therefore been directed.

What conditions may be pointed out that were peculiar to coal-making epochs? The following may be suggested: Peculiarity of material; Resiniferous Vegetation etc.?

Overflowing of the swamp or jungle by fresh water conveying atmospheric oxygen or carbonic acid or both?

Accnmulation of the material in large bodies or thicknesses?

Peculiar constituents in the overflowing water, engendering special chemical metamorphoses?

In my consideration of the subject, none of these have seemed to give any satisfactory solution except the last; and I am led inevitably to associate the coal-making process with *Iron* held in solution in the waters of the coal-making epochs.

The iron compounds which always accompany coal are *pyrites* (never pyrrhotine) *chalybite* or siderite, *ferrous hydrate*. These come of course from the fragmental beds which intervene between the coal-seams, and must have been conveyed in solution, having been brought into that state by action of oxygeniferous water on the sulphides of the crystalline schists from which these fragments originate. Hence the reason why little or no coal genesis occurred before the Carboniferous, as, previous to this, the atmosphere was not sufficiently oxygenated as yet by the influence of Life, the great and only Oxygen-maker (according to the author) to form the ferrous solutions necessary, that is over the general terrestrial surface. Nevertheless such oxygenation may have occurred locally before this Era, and hence the local formation of Coal which some geologists maintain, in sediments older than the Carboniferous.

It follows from the views held by the author, as set forth in previous papers, that another dissolved ingredient in these waters (that is, fresh waters) must have been *carbonic acid*, in not unimportant quantity. It would appear that the reactions did not involve evolution of sulphuretted hydrogen, because of the absence of pyrrhotine and uncombined sulphur. The combined sulphur of coal, as is now well understood, is not necessarily in the form of iron-sulphide, but doubtless as sulphuretted resinoids, like CHURCH'S *tasmanite*, etc.

Coal, then, is the normal product of a peculiar eremacausis of organic matter in waters containing ferrous sulphate and free carbonic acid Enormous pressure upon a plastic mass has without doubt been a subsequent and essential element.

The oxidating reaction which was chiefly concerned in Coal-Genesis I would represent as follows:

$$4(FeO,SO^3)+7C=2FeS^2+2(FeO,CO^2)+5CO^2.$$

In consequence of the establishment of a ten-minute rule in this discussion, the author was obliged to omit, and defer to another occasion, some further views on the modes of genesis of petroleum and bituminoid minerals.

Prof. SEELY has handed me the following minute remarks in his discussion of my paper:

When we shall have learned a little more than we now know of chemical reactions at high temperatures, it will be practicable to write a chemical history of all the elements of matter beginning with the nebula of LA PLACE. Perhaps we already know enough of oxygen and carbon to trace the most important facts of their history. Oxygen combines with all other elements, and with most of them at high temperatures, while carbon at high temperatures, and in the presence of an excess of oxygen, will combine only with oxygen and only to produce carbonic acid. Taking as a basis these properties of oxygen and carbon, and the well known fact of the excess of oxygen in the known mass of matter, it follows that when our globe had cooled down to the ordinary red heat, all the carbon would be combined with oxygen and exist in the form of carbonic acid. The atmosphere at this period of the history had for its principal constituents water-vapor, nitrogen, free oxygen, and carbonic acid, which latter would contain all the carbon in existence on the globe. On the further cooling of matter down to the condition required by vitality, most of the water-vapor was condensed, and the greater part of the carbonic acid was absorbed in the water, and had united with bases to form earthy carbonates, for which changes the conditions were peculiarly favorable. It may be fairly concluded from such reasoning, that since the advent of life, the constitution of our atmosphere has not materially been changed.

[The assumption that there was, or is, an "excess of oxygen" over that necessary to peroxidize the carbon and iron of the earth's crust, is the very fundamental assertion that my own inductions have led me to combat.—H. W.]

Dr. STEVENS remarked that he sought for explanation of Coal-Genesis from physical and physiological laws of the present. His observations in the forests of the tropics had led him to doubt, whether a tropical climate existed in the Carboniferous age in latitudes where the rocks of this age are most prominent. His observations of the coal of the true Carboniferous, Devonian, Cretaceous and Tertiary, led him to the conclusion that there never was as much carbon eliminated at any one time from the atmosphere as at present.

When studying all the phenomena attending the coal measures, both of this country and Europe, he had come to the conclusion that the atmospheric conditions attending the flora and fauna of the past, were essentially the same as at the present.

The deposition of the coal measures, including carbonates of iron and lime, as well as coal, began in the Silurian, and continued to recent times. The geographical area of the Devonian exceeded that of the Silurian, and the Carboniferous that of the Devonian; the Jurassic and Triassic were equal to the Carboniferous, that of the Cretaceous exceeded the Carboniferous, while that of the Tertiary was of great extent. Not only were these extensive areas of coal in each, but the aggregate thickness of the deposits was great.

The deposition of coal began with the mollusca era, continued through the reign of fishes, sauroids, and mammals. Hence, he inferred that the relative quantity of carbonic acid in the atmosphere, must have been the same throughout all time. Another line of thought was that the deposition of coal was mainly in the temperate zones of the earth on all the continents save that of South America, in each and every age of its deposition; hence he looked to physical and geographical causes for its deposition, rather than to any special chemical condition of the atmosphere.

[Extremely interesting remarks were also made by Professors NEWBERRY, HITCHCOCK, WALZ, GALLATIN and others; but space fails us to report them. The subject will doubtless be resumed at subsequent meetings of the LYCEUM.

I have the pleasure to add here that just as this number was going through the press, an original contribution on the subject has come to hand from Prof. STERRY HUNT on this very subject; but unfortunately too late for insertion. It will appear in our next, with some editorial comments.

Dr. A. A. HAYES contributes, also just too late for the present issue, an important original article under this title, which comprises much practical as well as scientific information, and for which our readers will thank him heartily, as we do. It will of course appear in our issue of February 2.—H. W.]

ON THE FORMATION OF OZONE BY RAPID COMBUSTION.

[Read before the NEW YORK LYCEUM OF NATUREL HISTORY, *Chemical Section*, Jan. 10, 1870, by OSCAR LOEW, Chemical Assistant in the College of the City of New York.]

According to SCHOENBEIN in very slow oxidation there is a previous formation of Ozone, ordinary oxygen not being able to combine directly with other elements. CLAUSIUS advanced in 1858 the hypothesis that Ozone is oxygen in the state of *free atoms*, while common oxygen consists of compound *molecules*, of two combined atoms each. But the later investigations of ANDREWS and TAIT, BABO and SORET upon the volume of Ozone do not favor this supposition and CLAUSIUS modified his hypothesis thus: *Ozone is a compound of a single atom of original oxygen with a molecule of common oxygen.* This combination is but a loose one, and the power of oxidating possessed by Ozone resides in the third atom of oxygen, which combines directly with elements leaving common oxygen behind. This view of the formation of Ozone may be represented by the following formula:

$$\underset{\text{Molecule of common oxygen.}}{3([OO])} = \underset{\text{Ozone.}}{2([OO]O);}$$

and the oxidation of a metal by Ozone is represented by the equation:

$$([OO]O) + M = MO + ([OO])$$

When we now take into consideration that Ozone and Antozone give together the common oxygen, we must conclude that Antozone is original oxygen in the state of free atoms:

$$\underset{\text{Ozone.}}{([OO]O)} + \underset{\text{Antozone.}}{([O])} = \underset{\text{Common oxygen.}}{2([OO])}$$

It seemed to me that at every combustion, even in the most rapid and energetic, this intermediate decomposition of the molecule of common oxygen must take place, if the single atoms will enter into combination with the elements, and that Ozone or Antozone could be detected in a flame, if the high temperature did not destroy it again as fast as it is formed.

To test this hypothesis I blew a strong current of air through a tube into the flame of a Bunsen's burner and collected the air in a beaker glass. In a few seconds I had enough Ozone to be distinguished readily by the intense smell and by the common tests, tincture of Guiacum, Iodide of Potassium, etc. This observation shows that not only in slow oxidation but also in rapid combustion an intermediate production of Ozone occurs, and that it can be separated and isolated in this way.

Mr. LOEW demonstrated this new ond extraordinary fact before the LYCEUM, and many of the chemists present convinced themselves of the intense ozonic odor developed by this simple means. A most interesting discussion arose thereupon, in the course of which Dr. ISIDOR WALZ took the ground that it had been shown by SORET and others that SCHOENBEIN'S *Antozone* was a myth. This idea was strenuously antagonized by Mr. LOEW, who cited the phenomena of the remarkable Bavarian *fluorite* of Woelsendorff, the emanations from which (found by SCHROETTER to be Antozone) frequently nauseate the miners. Prof. JOY supported this statement and said that he had himself a sample of the *Antozonite*. Prof. WURTZ inquired what significance we were to attach to the investigations of MEISSNER, who found a modification of oxygen, which from its characteristic property of retaining water in the condition of fog or mist for a very long time, he at first called "*Atmizone*," but afterwards, by very elaborate experiments, he identified it with SCHOENBEIN'S Antozone. Nothing further, however, was elicited, of importance, on these questions.

Prof. SEELY called attention to the striking feature of this discovery, that it was one we all had stumbled over, and any one of us might have made it, had we had like Mr. LOEW the acuteness to *look for it.*

He also commented on the commanding import of Mr. LOEW'S discovery, in view of the influence Ozone is generally believed to have on human health; as this source of it is one which must be extremely prevalent.

H. W.

The following paper was read by Mr. LOEW at a previous meeting of the LYCEUM:

ON THE ACTION OF SUNLIGHT ON SULPHUROUS ACID.

[Communicated to the LYCEUM OF NATURAL HISTORY of New York, by OSCAR LOEW, Chemical Assistant in the College of the City of New York.]

We know that plants, under the influence of the sunlight, reduce within their substance carbonic acid and water to organic compounds and organized tissues. We know further, that the albuminous parts, as well as some essential oils of plants contain sulphur, which doubtless comes from the sulphates contained in the soil.

As regards this reduction of sulphuric acid in the plants, it seemed to me of some interest to try whether the sunlight possesses any reducing power upon the oxygen compounds of sulphur outside of vegetable tissues. For this purpose I exposed diluted sulphuric acid, solutions of sulphates, sulphites, and aqueous sulphurous acid, under various conditions, in sealed tubes, to the sunlight of last summer. With sulphurous acid only did I notice any change; and even the tubes containing this remained *clear during two months*, but after that time a change set in which slowly increased, and sulphur was deposited in a finely divided state.

Sulphurous acid was thus gradually reduced to sulphur, but *oxygen was not liberated;* another part of the acid having been oxidized by it to sulphuric acid. It seems very singular that such a period (two months) was required to initiate this change; and it would appear that a previous absorption of a great amount of light was necessary to the separation of the first atom of sulphur, which was followed then, however, by more atoms at shorter intervals.

DR. VAN DER WEYDE, ON LIGHTNING RODS.

(*In Reply to* DR. BUSHEE, *in* REPERTORY *of Jan. 3rd.*)

NEW YORK, January 11, 1870.

Prof. HENRY WURTZ: Dr. BUSHEE, at the end of an extract of his paper on the above subject, mentions the remarks I made at the AMERICAN ASSOCIATION in Salem. He may differ in opinion, but it is here not a question of opinions but of facts. When in Salem, he called a spring or well an unsafe mode of connection, stating that gas or water-pipe connections were far more safe; now he retracts this opinion partially, but still says he prefers the water pipes. Besides the fact that isolated houses more exposed to lightning, seldom possess either gas or water pipes, this is a dangerous doctrine Gas pipes are only connected with the ground by intervention of the meter, always made of thin metal

and easily destroyed or injured by lightning; besides, the joints are often made by sealing-wax, an insulating substance, giving a number of small breaks in the connections. Then, as a rule, many parts do not contain metal enough to convey heavy charges; and what is the strongest objection, they are every where branching off in dangerously close proximity to the inhabitants of the house, not to speak of the consequences of damage done to the gas pipes. Water pipes are better, but still these are often too much diffused through the interior of the house, to afford the safety of a system of rods kept entirely outside, and well connected with a good spring or well, which geologically cannot be so situated as to "offer any considerable resistance to conduction of electricity." Fears on this head are utterly unfounded. If a locality, where the earth is always moist, has proved to offer a reliable connection, much more reliable is a well or spring, provided it is not dry at certain seasons, and the connection is made deep enough always to offer sufficient metallic surface to the water. A buried metallic plate, as is customary in telegraph battery connections, or three long pointed iron rods entirely driven into the earth in diverging directions, so as to reach moisture, and connected at the top with the main conductor, as is the custom in Holland (where the very first lightning rod was erected on a church, and where no lightning rod has ever failed yet); these are the safest methods.

Now I wish to say a few words in regard to Dr. Busher's proposition, which he made seriously in Salem, namely, in case the ground is too dry for a reliable lower connection, then to attach a long point to the lower extremity of the main conductor, and let it project out of the earth into the air. About this he now says: "There is good reason to believe it will do much to weaken and dissipate the charge." If we consider that a thunder-cloud charged with positive electricity causes the nearest part of the conducting earth's crust, either on or at a distance below the (sometimes insulating) surface to become negative by induction; that both are thus nearly equally charged, by opposite electricities, and that the only function of the lightning rod is to establish such a conducting communication between the two (the cloud and the moist earth below the surface) so as to cause the two opposite electricities to flow together and thus to neutralize one another, (either by gradual current, or if necessary by explosive discharge,) the absurdity of these lower points becomes evident. Both the extent and the charge of a thunder-cloud are too great to be affected appreciably by the small amount of electricity the air around the house may absorb, if it really does absorb it; but this is exceedingly doubtful. Besides, in the case supposed, of defective ground connection, the cloud, the house, and the air around it are all most likely charged with the same electricity, especially when the air is saturated with moisture; in this state of affairs the isolating intervening substance in place of being the air, as usually is the case, is then the dry ground under the house. This has to be perforated by the exploding charge while the whole amount of electricity of the cloud, etc., will follow; if now the lowest part of the lightning rod reaches deeper than any other conductor, of course the discharge will pass by the same; if it is only buried a few inches in the dry earth, as many ignorant constructors make them in this country, there is great probability that the stroke will follow some other course and do damage, notwithstanding all these points at the lower end.

The whole question lies in a nutshell; the error is the mistaken notion that *the real lightning rod is the point* on the top of the house; I have always taught the doctrine that *the real lightning rod is the perfect ground connection* with a well or spring, and in lack of this, with moist earth, as deep down as practicable, a few metallic conductors being led upward from this along the building to the most exposed extremities without unnecessary isolation, and without absurd points below, till these conductors reach the highest part of the building; this is all that is absolutely necessary. The projecting point above, usually called *the lightning rod*, might even be omitted; but without *the true lightning rod below*, deep down in a spring, a well, or in the moist earth, the whole thing is a most dangerous affair. P. H. Van der Weyde, M. D.

SELECTIONS FROM BERTHELOT.

The following significant words of Berthelot, from the introduction to a Memoir on the *Theory of Hydrocarbons*, are commended to that class, just now so prevalent, who mistake artificial and uncouth systems of notation and nomenclature for the Science of Chemistry itself: "Equations of weight between real bodies, and the general relations which exist between the said equations, that is to say, *Laws*, properly so called, are the only absolute truths of chemical science. Radicals, Atomic-Notations, Figurative (*figurees*) representations of the constitutions of bodies and of the bonds of atoms; all these are but conventional and variable symbols; whatever convenience may be found in the use of these symbols."—H. W.

Isomerisms.—Berthelot's general expression for the composition of hydrocarbons, to which may be referred the whole of the immense multitude of cases of Isomerism, every day multiplying; as he says, "without resorting to any special hypothesis"; is as follows:

All hydrocarbons may be looked upon as formed by the combination of two simpler hydrocarbons, starting with *formene* (marsh gas) $C^2 H^4$

$$C^{2n}H^{2m} + C^{2p}H^{2q} - sH^2 = C^{2(n+p)}H^{2(m+q-s)}$$

So many distinct hydrocarbons may exist as correspond to any values of these five variables, so long as $(n+p)$ and $(m+q-s]$ remain constant.

More than this: Each of the carburets $C^{2n}H^{2m}$ and $C^{2p}H^{2q}$ may be itself constructed in the same way, by a great number of distinct methods and by means of simple carburets, from which there results, for each system of values (of m and n, p and q) an immense number of corresponding metameres.

It is hence that calculations have been made as to the number of compounds of these two elements alone that it is possible for us to produce; whence it appears that if a name of the average length assigned at the present day to organic compounds be attached to each, all the books in the world would contain but a tithe of these names. The virtue of this is in convincing us of the necessity of systems of nomenclature in the Chemistry of the Future, far different from those now in use by most organic chemists.—H. W.

The New Tunnel in Chicago.

A second tunnel is to be built under the Chicago River at Chicago, for the purpose of connecting the two divisions of the city. The work has already begun. The Chicago *Tribune* gives a detailed description of the proposed tunnel, from which we take the following facts and figures:

"The tunnel is to be placed with its centre line in the centre of LaSalle street. The southern approach is to begin 40 feet north of the north line of Randolph street, and the north approach to terminate at the south line of Michigan street. The bottom of the tunnel, or top of invert in the centre of the river is to be 35 feet below low water. The grades between the ends of the approaches and the centre of the river to be uniform, except on the river portion of the work, where it will be less than on the approaches. The tunnel under the river is to consist of three passageways. The east one for foot passengers, and the other two for horses and vehicles drawn by horses. The east passageway is to be 12 feet high between the bottom of the upper arch and the top of the invert. The width of this passageway is to be 10 feet. The other passageways are to be 11 feet wide, their inverts to be segments, the upper arches to be from three centres; a flagging course of ten inches thick is to be laid entirely across from one side to the other of the tunnel. The section of the tunnel above described is to extend entirely across the river, a distance of 300 feet. The flagging course over the top of the tunnel will extend for a distance of 280 feet only, including two and a half feet to be built under each dock wall. Beginning at a point 150 feet each way from the centre line of the river, the section of the tunnel changes to a single opening or passageway, beginning here with a width of 24 feet 4 inches, and diminishing to a width of 19 feet 6 inches, in a distance of 40 feet, or to points 190 feet on each side from the centre line of the river. At the point 150 feet each way from the centre line of the river, the centre of the single passageway begins with a height between the top of the invert and the bottom of the top arch of 21 feet.

"The opening approaches to the tunnel on each side, and the passageway for horses, are to be paved with wooden block pavement (the whole distance being 1,890 lineal feet), resting on lake shore sand, in the manner shown on plans, and according to the usual specifications of the Board of Public Works for such pavements.

"The contract requires that the river shall be entirely free and unobstructed, as also North and South Water streets, by the first day of April, 1871, and the tunnel to be completed and ready for public use by the first day of July, 1871. This is about the same length of time employed in the construction of the Washington street tunnel. The total cost of the LaSalle street tunnel is expected to be upwards of $475,000."

The famous beds of phosphate of lime, near Charleston, S. C., cover an area of 600 to 700 acres. They are eighteen inches to two feet thick; the phosphate is worth in Charleston $6 a ton for fertilizing purposes, and the value of the entire deposit is estimated at $6,000,000. It is proposed to construct a canal fifty feet wide, three feet deep, and two miles and a quarter long, extending from the phosphate beds to Ashley river, so that the material can be boated down to the city.

Horne's Improved Belly-Band Fastener.

Patented November 30, 1869.

The engravings presented herewith represent an improvement which will commend itself to the majority of the readers of this Journal, and every one who is fond (and who is not?) of the exhilarating and healthful exercise of equestrianism. If not quite pertinent to the specialties of this publication, its positive merit and general usefulness is a sufficient reason for introducing it.

This invention has for its object to furnish an improved fastener for cinching up riding and pack-saddles, which shall be simple in construction, and convenient and effective in use.

The cuts will give a clear idea of the construction and operation of this invaluable improvement. It is only necessary for the rider to pull upon the loose strap, without dismounting. This tightens the band, and the strap being held in place by the tongue-lever or clamp. It is the work of an instant only, and may be done when on a full gallop. It has the merit of safety, expedition in adjustment, and convenience. All horsemen, and especially cavalrymen, hunters, etc., will appreciate this convenience. No horseman or horsewoman should ever ride without this fastener. The want of it has cost many a life.

It is manufactured by Barnet, Stainsbury & Ballard, corner Railroad avenue and Johnson street, Newark, New Jersey. John W. Gearhart, is General Agent, No. 22 Pine street, Room 9, New York, of whom further information may be obtained.

Horse-Power.

The vagueness of this phrase leaves it undecided whether nominal or indicated horse-power is desired. This distinction is important, since the indicated power of engines ranges from one to six times the nominal power, and even higher. The nominal horse-power is deduced from dimensions, the indicated horse-power depends directly on the pressure of steam and the velocity of the piston. There are different rules for different sorts of engines. Rankin gives one for condensing and one for non-condensing engines, together with the rule adopted by the British Admirality, and applicable to screw-propeller engines only. The rule for non-condensing engines is to multiply the cube root of the stroke in feet by the square of the diameter of the cylinder in inches, and divide by 20. But the nominal horse-power thus obtained is a quantity without much practical significance, since it does not include as a factor the actual effective pressure of steam. On the other hand, the actual power of an engine in operation may be calculated as follows: Find the mean effective pressure of steam behind the piston. This is usually about eight-tenths of the pressure calculated from the indicater-diagram. Multiply this measure, expressed in pounds per square inch, by the area of the piston, expressed in square inches. The result is the pressure or weight constituting the load upon the piston. This load, multiplied into the number of feet traveled by the piston per minute, gives the number of foot-pounds per minute developed by the engine; and as 33,000 foot-pounds per minute constitute a horse-power, the actual horse-power can be ascertained by using that figure as a divisor.

Correspondence.

[Correspondents in all cases should sign their communications with their names and address in full, not necessarily for publication, but as a guarantee of good faith.—Eds.]

Letter from Abroad.

GASFABRICK, DORDRECHT, HOLLAND,
December 15, 1869.

Messrs. M. L. CALLENDER & Co.,
22 Pine street, New York, U. S.

Gentlemen: As you have no agents in this country, you will much oblige me by sending your Journal, through your agent in London, to the address of my son—D. J. P. Van der Made, Student, Royal School of Naval Architects and Marine Engineering, South Kensington Museum, London; also "Dunbar's Gas Retort Setter's Guide," $5 attending.

I remain, gentlemen, yours respectfully,
J. M. VAN DER MADE, C. E.,
Manager.

[We take pleasure in publishing the above letter, as it will give our readers some idea of the position of the Journal in foreign countries. Similar letters are constantly received by us from all parts of Europe.—Eds.]

Complimentary.

ZANESVILLE, GAS-LIGHT CO., O., Jan. 4, 1870,

Messrs. Editors: We have not received our GAS-LIGHT JOURNAL (No. 12); it is due here about the 18th of December. You may, if you please, send it, and the 1st January number at the same time. We have your receipt for the next year's subscription, so we think it cannot be for that reason the paper has not come. We find your Journal very interesting, and would not like to lose a single number. Yours respectfully,

EUGENE PRINTZ,
Sup't Zanesville Gas Works, Ohio.

What is Thought of the Journal as an Advertising Medium.

ENGLEWOOD, BERGEN COUNTY, N. J.
January 13, 1870.

Messrs. Editors: YOUR GAS-LIGHT JOURNAL is a first rate paper to advertise in, for those wishing a situation in anything appertaining to gas matters. I have received its benefits on two occasions, and shall not hesitate to ask its assistance again, should I wish at any time to change. Yours respectfully,

T. T. T.

About Gas Meters.

PEEKSKILL, N. Y., Dec. 22, 1869.

Messrs. Editors: Desiring to know something of the experience of others in the use of meters, I will state my own. I have operated three gas works for a number of years; in one there is about two hundred wet meters, set mostly in 1855, and nearly all are still in use, and will last some years longer. I have found it best to fill them with glycerine, as it does not injure nor prevent the working of the meter, and does not freeze nor evaporate. In 1858 I concluded to try the dry meter, and set about one hundred and fifty slide valve in another place where I had erected works. The first time of taking the register (a month after they were set) I noticed that some of them was not registering; we took them out and tried them, and found them leaking through the valves; wherever condensation took place they would not register correctly. They have given much trouble, and there has been much loss from them.

In 1859 I had occasion to use about one hundred and fifty more in another place where I had erected works, and concluded to try the rotary valve dry meter. I found that they did not leak through the valve. I have put in use about five hundred of them, and have never found one that did not measure all the gas. I have taken out and tried many of them after they had been in use for years, and always found them to measure all the gas. They are more reliable than even the wet meter, as the valve does not always close in it when the water is too low.

The dry meters that were set ten years ago are still good, only the slide valves have given us so much trouble that we are taking them all out and replacing them with rotary valves; I have used both two and three diaphragm and they both work well. Yours truly,

G. T. SUTTON.

On the Action of House Sewage on Lead Pipes.

At a meeting of the Glasgow Philosophical Society held December 6th 1869, the following paper was read entitled "Note on the Action of House Sewage on Lead Pipes."

In introducing it the author, MR. EDWARD C. C. STANFORD, F.C.S., referred to the panic which had recently been shown by the voluminous correspondence in the local papers regarding the alleged impurity of the water used for domestic purposes, and stated that it had revived the old question of the action of the purer kinds of potable water on the lead of the pipes and cisterns. The panic, known locally under the name of "death in the cistern," had been completely allayed by the remarkable unaminity of the reports prepared by Dr Anderson, Professor of Chemistry, and Dr. Wallace, Analytical Chemist, and backed by an eminent medical authority like Dr. W. T. Gairdner. Notwithstanding, however, that the amount of lead was small, a sufficient quantity had been found in almost all the analyses of the cistern water to show the desirability of avoiding all suspicion of lead contamination, by adopting a constant high-pressure service in iron pipes, and, where they are required, of using cisterns of iron or slate. The author remarked that much attention had, from time to time, been directed to the action of the purer kinds of potable water upon lead; but it was somewhat remarkable that an equally important and much wider-spread evil of a similar character had escaped notice. He referred to the serious deterioration which lead pipes undergo which are connected with water-closets: and he brought this subject under the notice of the Section in order that some light might be thrown upon the cause of the said deterioration. Dr. Fergus, a Glasgow medical gentleman, had the credit of first directing attention to the subject by tracing a close connection between the deterioration of the soil-pipes and the existence of various low febrile disease in the houses into which, from the degenerated condition of the pipes, sewer gases make their escape. By means of sketches and used-up specimens of soil-pipes, the author showed the nature of the action to which the pipes are subject from long use—the length of time varied from ten to sixteen years. Near the bend of the pipe leading from the closet the upper part becomes coated with a greyish white deposit that can be easily scraped off, and the interior of the pipe becomes pitted; while exteriorly, the pipe is at first blistered at the parts corresponding to the internal "pits" and in course of time it becomes quite riddled with holes, and quite gnawed away as it were. Mr. Stanford had analysed samples of the deposit from several soil pipes, and had found from 86 to about 93 per cent. of the deposit to consist of plumbic carbonate, and other ingredients being calcic carbonate, silica, insoluble plumbic oxide, water, and organic matter. After noticing the chemical compounds which, in solution in water, act readily upon lead, the author said that the deterioration referred to was not due to those substances, inasmuch as they were found in the excreta, whereas the injury to the pipes took place in the air-space of the bend, and not in the water-space in which the "trapping" was effected. It has been remarked by plumbers, that a piece of lime, or newly-mixed mortar, in contact with a pipe, rapidly eats through it, probably by the lime combining with the carbonic acid of the outside film, and so cleaning the lead that the action of the air repeats the process. In the opinion of the author, alkalies would probably have the same effect as lime, and so clean the lead that a moist atmosphere would act on it. The effect of pure water on lead is first to dissolve it as oxide, and then this is precipitated as oxycarbonate, which is very insoluble, pure water only dissolving 1-60th of a grain per gallon. Water free from air does not act on lead; and the author therefore thought the action referred to might be due to the air carried down by the rush of the water while the closet was acting, and by the carbonic acid, or by the ammonia of the gases of decomposition acting as a cleaner, the interior of the pipe being always in a moist condition. Mr. Stanford concluded by recommending the discontinuance of lead soil pipes, and the substitution of earthenware syphons and flanged cast-iron pipes.

Dr FURGUS, in opening the discussion, recommended that soil pipes should be ventillated, or that they should be used as the rain-water pipes. He gave some instances in his professional experience, of the connection between such diseases as gastric fever, diphtheria, etc., and bad soil pipes; and he strongly urged the periodical investigation of such pipes.

Mr. SUTHERLAND suggested that the action might be due to sulphuretted hydrogan or acetic acid; but Mr. Stanford said that plumbic sulphide had never been found in his analysis.

Mr. ANDERSON believed that nitric acid, resulting from the oxidation of ammonia, might have some influence in producing the injurious effects on the pipes. This view was supported by Mr. Hutton and Mr. Tatlock. The first mentioned gentleman referred to experience extending over sixteen years, and said that Loch Katrine water is very peculiar, in having an abundance of dissolved oxygen and very little carbonic acid, and that such water rapidly acts on lead, producing oxycarbonate, which is readily soluble in fresh water from the same source.

Mr. STANFORD replied that he had never met with nitrates in the course of his experiments.

A vote of thanks was awarded to Mr. Stanford.

Water Power.

The force of water running in a stream may be estimated in horse-power as follows: The mechanical effect produced by the descent of water is as the quantity and perpendicular descent. Were there no loss of power by friction, it is manifest that if twelve gallons of water, which weigh one hundred pounds were to descend six inches, when nicely balanced on a scale-beam, a corresponding upward motion would be produced in a weight of one hundred pounds placed in the opposite scale.

The mechanical power of twelve gallons of water in descending six inches would therefore be measured by its mechanical effect in raising one hundred pounds six inches. But in the application of water to the best water-wheels there is a loss of one third of the power by friction. Therefore one-third of the theoretical power is deducted to find the power available in practice.

Example: To calculate the power of a stream after the quantity of water per minute is found by the foregoing rules.

What is the power of a mill stream, which will supply during an ordinary dry season, 1,800 cubic feet of water per minute, with a fall of 16 feet?

1800 x 62½ = 112500 lbs. descending sixteen feet per minute, 112 x 50016 = 1,800,000 lbs. momentum per minute with a fall of 16 feet. A good breast wheel being able to raise only two-thirds of the quantity of water, which operates it to the level from which it descends upon the wheel, one-third of the power or force of the water is, therefore, wasted and lost, and only two-thirds of its weight is calculated upon as the actual availing power. Hence by the rules of proposition as 3 : 2 :: 1,800,000 to the answer = 1,200,000 raised one foot high per minute. Watt estimated a *horse power* at 32,000 lbs. one foot high per minute; therefore 1,200,000 ÷ 32,000 = 37.5 horse power the answer.

Pneumatic Railway of New York.

It is about twelve months the basement of the store on the corner of Warren street and Broadway was rented by the managers of the projected Broadway Pneumatic Railway. Operations were immediately commenced looking to the boring of that thoroughfare, but from that day to the present the utmost secrecy regarding the work had been maintained. The laborers are all sworn to secrecy as a condition precedent to their employment. Press reporters are denied admittance, and the public are, therefore, kept in comparative ignorance of the real nature and progress of the work. It is, perhaps, as well that the passenger in a Broadway bus, as he rolls over the pavement on the east side of that thoroughfare from Warren street to the southern terminus of the Park, is unconscious of what is going on beneath him. It is observable to every pedestrian, however, that the street pavement has sunk on that side in some places to as great a depth as six inches; but the cause not being observable, he perhaps thinks little of it. The cause is the burrowing of the agents of the Pneumatic Railway Company. The condition of Broadway at the place alluded to was discovered by our reporter in his efforts to gain some knowledge of the work going on. Inquiry as to how far the tunnel had progressed was met with a hint from one of the men employed that the surface of the street would possibly indicate it. Acting upon this, he followed the sunken portion as far down as the southern extremity of the Park.

Warren street, is strewn with huge pieces of machinery. Laborers are tugging at them, the while looking as wise as owls, but dumb as sphinxes regarding their work. This bulky machinery has evidently been

wrought at some other place, for each piece is marked "A. E. B., N. Y.," which indicates its consignment to Alfred E. Beach, New York, that gentleman being the President of the company. All means of communicating with the engineer are cut off, or so guarded, that one cannot get through, or rather down them.

This Pneumatic Railway was authorized by the Legislature of 1868, and the company consists of seventeen prominent citizens. It is provided in the charter that a pneumatic tube may be sunken through Broadway for the purpose of conveying parcels, dispatches, and mail matter to intermediate points along the route. Although operations commenced a year ago, and have been pushed both day and night, it has not apparently progressed further than stated above. At this rate, it will consume many years before completion. Its feasibility is assured, says the Superintendent, by the success attending the London railways, worked on similar principles. The manner of working these railways is sufficiently well known, though it is understood that improvements have been made which will render this one superior to those of London.—*N. Y. Tribune.*

Petroleum Production.

The total production during the month, as shown by the difference between the stocks on the first days of October and November and the shipments from the region during the mean time, was 405,206 barrels of forty three gallons each, or a daily average of 13,071 barrels. This shows an increase, as compared with the daily average for September, of a little more than 400 barrels, and of 3,000 barrels over the daily average for October last year. The increase was less general on the farms and districts than during September. The yield of many of the older producing farms and tracts fell off, and on several of them the decline was important.

The number of new wells in process of drilling increased during the month, and on November 1st the number in all parts of the region was 260, an increase of twenty-nine. Besides the above there were altogether about fifteen old wells being drilled deeper. These were located mainly in the Pleasantville district.

The stock underwent a further decrease during October, and on November 1st the total amount in all hands was 276,475 barrels of forty-three gallons, a reduction of about 16,000 barrels as compared with that on the first day of the previous month, and an increase of 10,000 barrels over that on the 1st day of November last year. The reduction was occasioned by unusually heavy shipments during the last four days of the month.

In the stock above given are included the amount at the wells, the amount in iron tankage, and that on the hands of dealers, pipe companies and refiners. This latter stock reached 13,970 barrels, and included 2,900 barrels at Titusville, 2,020 at Pithole, 1,500 at Shamburg, 1,000 on Bull Run, 1,200 on the Rynd Farm, 300 on Cherrytree Run, 1,600 at Miller Farm, 550 on the Story Farm, 2,000 at Petroleum Centre, 1,000 at Oil City, and 400 at Tidioute.

The total shipments of crude equivalent reached 421,229 barrels, of 43 gallons, or a daily average of a little more than 13,600 barrels, The shipment by the Allegheny river was light, having reached but about 2,500 barrels. The quantity shipped to New York was about 18,000 barrels in excess of that for the previous month, that to Cleveland about 2,000 barrels less, and to Pittsburg about 20,000 barrels less. The shipment to Boston fell off about 3,000 barrels, and to all other points there was an enlargement of a like amount.—*Titusville Herald.*

New Process of Refining Iron.—Mr. Palmer Budd's new process of refining iron was shown, in the works of Messrs. Bolckow & Vaughan, to the members of the National Iron and Steel Institute, after their meeting at Middlesborough. It appears that a patent has been taken out by Mr. Budd for the invention of such "improvements in the manufacture of iron and steel" as shall henceforth render the process of puddling much quicker and easier. This valuable result is said to be accomplished by the subjecting of molten cast iron to the action of soda and soft hematite iron ore—or other oxide of iron—previous to its being subjected to the puddling process. It was alleged by the patentee that the puddlers much prefer the iron in this condition, as it lessens and helps their work, and also that it will tend materially to cheapen the process of manufacture. In his opinion, the money value of the invention to the iron trade will be enormous; greater, perhaps, than that arising from the use of blast-furnace gases, said to be 1,000,000*l.* a year, and which Mr. Budd first introduced into this country, and made known to the iron trade at the meeting of the British Association held at Swansea in 1849.—*Builder.*

Recent American Patents.

Pertaining to Gas, Water. Etc.

97,766.—Water Heater for Culinary Purposes.—Royal E. Deane, Brooklyn, N. Y,

97,778.—Turbine Water Wheel.—Julius H. Jones, Charlton, Mass.

97,779.—Hydraulic Engine.—Henry J. King and Benton L. Beebe, Middletown, N. Y.

97,822.—Pneumatic Engine.—Robert Spear, New Haven, Conn.

97,864.—Steam Generator.—Edward Bourne, Pittsburgh, Pa.

97,869.—Water Wheel.—J. D. Bryson and J. H. Hartsuff, Newcastle, Pa.

97,881,—Valve for Water Engines.—Abraham Coates (assignor for one half, to James Martin Hunt), Watertown, N. Y.

97,888.—Water Wheel.—G. W. Cressman and Bert Pfleger, Barren Hill, and Nice Keely, Roxborough, Penn.

97,894.—Apparatus for Extinguishing Fires by Means of Chemical Agents.—J. W. Douglas (assignor to W. Douglas and B. Douglas), Middletown, Conn.

97,913.—Gas Stove.—W. J. Hays, New York City.

98,019.—Low Water Indicator.—Wm. A. Bradford, Cincinnati, Ohio, assignor to C. G. Pease, trustee for Malone Safety-Valve Company.

98,021.—Steam Generator.—M. S. Bringier, Ascension parish, La.

98,046.—Vaporizing Petroleum, Etc.—H. R. Foote, Boston, Mass.

98,081.—Water Wheel.—H. W. McAuley, De Soto, Wisconsin.

98,096.—Illuminating Stove.—B. Nott, Albany, N. Y.

98,118.—Gas Generator and Carburetter.—Amos Stevens (assignor to E. A. Whitney), Fitchburg, Mass.

98,173.—Composition for Preventing Incrustation in Steam Boilers.—G. W. Lord, Philadelphia, Pa.

98,174.—Gas Generator and Burner.—C. B. Loveless, Syracuse, N. Y.

98,208.—Self-Ventilating Safety Cans for Filling and Discharging Hydrocarbon Apparatus.—Lovias D. Towsley, Newark, N. J.

98,216.—Steam Engine Governor.—C. D. Allen, New York city. Antedated Dec. 24, 1869.

98,218.—Water Elevator.—Jabez K. Babcock, Shortsville, N. Y.

98,228.—Vapor Burner.—L. Chandor, St. Petersburgh, Russia, assignor to C. M. Clay, New York city.

98,287.—Street Box for Gas Pipes.—Emerson McMillin, Ironton, Ohio.

98,330.—Turbine Water Wheel.—O. N. Angell and A. J. Angell, Providence, R. I.

98,442.—Apparatus for Producing and Carburetting Hydrogen Gas.—John H. Steiner (assignor to himself and Christian Sharps), Philadelphia, Pa.

REISSUE.

73,900.—Carbureting Air for the Production of Light and Heat.—Dated January 28, 1868; reissue 3,779.—Blakey Pilkington, Oakland, Cal., assignee, by mesne assignments of James D. Jenkins.

Fall in the Price of Coal.—Since the close of navigation the retail price of coal has gradually fallen, and a decided reduction in price has taken place. The large demands from wholesale dealers having ceased, the wholesale companies who own retail yards in this city turned their attention to the latter trade, and the prices immediately fell. On the 10th December the Delaware and Hudson Canal Company reduced the retail price of grate, egg, and stove coal, from $9 to $7.50, and the price of chestnut from $9.50 to $6.50 per ton of 2,000 pounds. This reduction was accompanied by a reduction in the wholesale price of from $1.40 to $2.90 per ton of 2,240 pounds. The Pennsylvania Coal Company have made a reduction since November 1 of about $1.50 per ton. Their present prices are, for grate and egg, $7.50; stove, $8; chestnut, $7. The impression among dealers is that there will be a still further decline. Coal is now coming into this city at the rate of 10,000 tons a day, which amount must be absorbed by the local trade, as there is little or no outside demand. The fall in price, while greatly benefitting the consumers, will not injure the retail dealers, most of whom, in anticipation of the fall, had laid in very small stocks.

The Oil Men.—The action of the Board of Health in prosecuting the retailers of explosive kerosene oils, and the press in publishing its chemical analysis of these deadly compounds, have struck terror into the unprincipled manufacturers and dealers. Many persons have been driven from the business entirely, owing to the fact that the sale of pure oils is no longer remunerative, owing to the competition of the unprincipled dealers in inferior compounds. The manufacturers, it has been ascertained from Sanitary Superintendent Harris, have resorted to a new dodge to evade the law. They continue to sell oil largely mixed with naphtha and other explosive compounds, but take the precaution to mark on the invoices "for cleaning purposes." After the oil is out of their hands they care but little whether it is employed for cleaning purposes or to blow up and burn the consumers. It is likely that Dr. Harris will take occasion shortly to make a report covering the entire subject, and offer suggestions for preventing the sale of the article.

Extraction of Benzol from Coal Gas.—All coal-gas contains the vapor of benzol, in more or less quantity. By means of cooling mixtures, pressure, and the use of some chemical reagents, as, for instance, strong nitric and sulphuric acids, chlorine, and bromine, benzol may be withdrawn, more or less completely, from coal-gas; it appears, however, that the following simple and effective plan suggested by the author, M. Mounier, answers the purpose far better, since it is by a simple application of a solvent that the benzol is obtained: The gas is made to pass slowly through coal oils (liquid hydrocarbons), the boiling point of which is higher than that of benzol; but it has been ascertained that petroleum, paraffin oils, schist oils, and even fixed fatty oils, will answer this purpose equally well. After a time, these fluids become saturated with benzol and the latter is obtained by fractional distillation. It should be borne in mind, however, that gas thus deprived of benzol and its homologues loses a great deal of its illuminating power, even so much, in some instances, as to be only fit for heating purposes.

Proportions of Belts to Drive a Given Horse Power.—Mr. F. W. Bacon, of New York, gives the following proportions of belts to drive a given horse power: Multiply the horse power required to be transmitted through the belt by 36,000; divide the product by the number of feet or parts of a foot the belt is to run per minute; divide the quotient by the number of feet or parts of a foot in length of that part of the belt in contact with the smaller pulley; divide this last quotient by six, and the result will be the width of the belt in inches.

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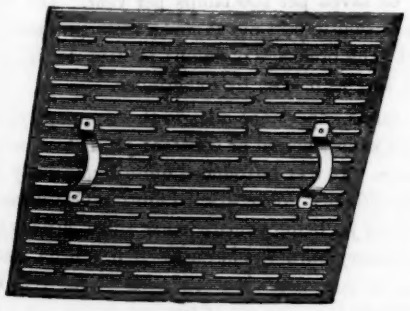

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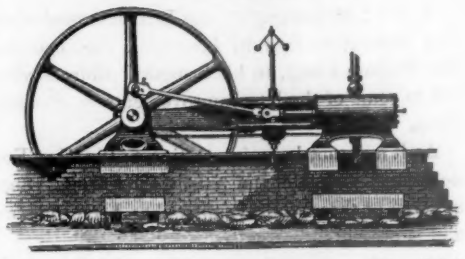

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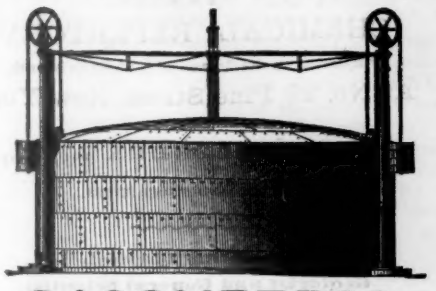

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[NOTE BY PROFESSOR WURTZ.—Contributions and items for which I am, as a Scientist, individually responsible, will have attached my full name or initials.—H. W.]

MONDAY, JANUARY 17, 1869.

WISHING TO MAKE this Journal an organ of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, the publishers solicit letters from all among them who make the study of those subjects a pleasure, or a profession.

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IMPROVEMENTS IN GAS MANUFACTURE IN ENGLAND.

At the last meeting of the British Association of Gas Managers, held in Liverpool, the President, Mr. William Esson, in his inaugural address adverted to some of the late improvements in gas apparatus.

As it may not be uninteresting to the Gas Engineers on this side of the Atlantic, a brief synopsis of some of these improvements has been prepared, and is presented herewith.

NEW PURIFIER.—This improvement, said to be patented in England by Mr. Arthur McDougall, is essentially the same as patented in this country about two years ago, by Mr. William Turnbull of New York, and was illustrated and described in Number 11 of this Journal, vol. 8, December 3rd, 1867. It consists of a large cylindrical vessel provided with a series of sieves or pans, one above another. In the centre is a vertical shaft revolved by bevel gearing, driven by any convenient motive power. This shaft is provided with cross-arms (one to each pan), to which are attached pins or plates, arranged at such an angle, as to move the purifying agent from the centre to the circumference of the pans, and at the same time, to turn over and agitate the mass, not unlike a harrow or cultivator. Discharge openings are provided at the outer edge of the pans, so that the lime or other purifying agent may drop from pan to pan, and at last, into a receptacle at the bottom. Here it is subjected to a current of air, and then raised to the top of the purifier again by an elevator; and the process repeated until the material is thoroughly saturated or spent.

It is asserted that this apparatus being automatic, is labor saving, and that it is a great saving in the purifying material and the gas.

PIPE COUPLING.—Messrs. C. M. Barker & Co., are credited as the patentees of a jointing or coupling for gas-mains having an elastic packing, in conjunction with an iron ring slightly tapered, to make a joint securely and expeditiously. The pipe has a "screw and flange spigot cast with a male thread, and the socket with a female thread." The spigot is inserted into the socket and turned once round, closing the joint, compressing some moist cement at the end of the thread; the taper end of the spigot or pipe enters the conical cavity of the socket, and is also provided with moist cement. The joint is firmly sealed when the cement sets.

A somewhat similar but more simple and effective improvement has recently been patented in the United States by our agency for Edmond Smith of Hamburgh, Germany, which is intended for both gas and water mains and pipes. One great advantage it has is, that it can be readily placed without excavation about the joint, and as readily disconnected, and the pipe replaced or taken up without injury. It also dispenses with the costly leaden packing entirely, and can be readily adjusted to uneven surfaces, or deflected to any necessary angle. It can be applied readily and effectually to secure broken pipes, or to introduce short lengths for attaching seavice pipes, etc.

SELF-SEALING RETORT LID.—The next noticable improvement is a self-sealing retort-lid, patented by Mr. R. Morton of the Phoenix Gas Works, London. It consists of a wrought-iron lid, stamped out with its edge turned up all round. The front of the mouth-piece is turned or faced true. The object is to reduce the bearing surface of the lid on the mouth-piece to a minimum. The lid being very light but convex in form, which gives it sufficient rigidity to sustain the force of the screw, or cottar-bar lever. It is capable of being hinged to the mouth-piece in conjunction with the cross bar, because no luting is necessary, and this seems to be the proper application of it.

This invention appears to have much real merit The dispensing with the luting and its consequent cost and the trouble and labor of applying it, is a great consideration. The saving of time and gas by being able to close the retort more quickly is another consideration. This lid is made circular in order to adjust uniformly to the strain of the screw, and the mouth- piece is necessarily of the same form. It will be well worth while, to see if this principle cannot be made to apply equally well to D shaped mouth-pieces, which will obviate changing the form, which is most in use, and otherwise preferable to the circular form.

SELF-ACTING LIGHTING AND EXTINGUISHING APPARATUS.—Mr. E. Price, of the Hampton Court Gas Works, England, is the claimant of this invention. It is, however, essentially the same patented in this country three years ago by a Mr. Locke of Chicago, combined in addition with a pressure regulator.

It is described thus: It is a small instrument somewhat similar in appearance to an ordinary lamp-governor, having an inlet in connection with the vertical lamp service-pipe, and furnished with a flexible diaphragm, which is acted upon by additional pressure of gas beyond that to which it has been weighted, thus giving motion to a valve which is above and not below, its seat, as in the ordinary lamp-governor, so that when the pressure is put on at the works the valve opens instead of closing, and allows the gas to pass to the burner. In the chamber beneath the diaphragm an opening communicates with a very small jet burner, for the purpose of supplying a supplemental light. This small jet, not being controlled by the valve, is constantly burning.

When the pressure is put on at the Works in the evening the valve opens, and allows the gas to pass to the burner, which is instantly lighted by the jet. When the pressure is reduced at the Works in the morning, below that to which the diaphragm is adjusted, the valve entirely closes, and the gas is extinguished, with the exception of the small independent jet, which is left burning.

The inventor claims: 1st. A saving in gas, owing to the lamps all being lighted or extinguished at nearly the same time. It is claimed a half hour both night and morning is saved in point of time on an average, equivalent to an economy of five feet of gas per lamp per day. The constant jet is assumed, to consume three feet per twelve hours, leaving a net saving of two feet per day or 730 feet per lamp per year, or 73,000 feet per 100 lamps per year.

2d. A considerable saving in lamp lighter's wages which all put together, is estimated to amount to £47 6s saved per 100 lamps per year. The apparatus is said to cost about seven shillings each.

3rd. The breakage of lamps is said to be very much less, as proven by experience.

So far as experience goes in this country regarding the supplemental or constant jet, it has proved a failure. It was introduced quite extensively under the title of "Locke's Self-Lighting Gas Burner." The little jet being adjusted near and a little below the ordinary burner, and enclosed in a little metallic cup or case, to prevent currents of air from extinguishing it. The act of turning on the gas at the stop-cock, of course had the seeming effect of self-lighting. The cause of its disuse is owing to the liability of the jet being extinguiseed by the varying pressure, or by obstruction of dust or condensation in the small passage or jet. It was found also in practice to burn much more gas than estimated, costing the consumers about six cents per day, or $21.90 per year.

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To this end we invite attention to the recently invented and simple *Level*, presented and described on the first page of this Journal, the invention of Hamilton E. Towle, Civil Engineer, New York City, intended for the establishing of *levels* for foundations, walls of houses, bridges, concrete piers, bottoms of artificial ponds, etc, etc., and the determination of the differences of elevation of different points on streams of moving water, or between other objects or surfaces, and also for *grading* roads, walks, ditches and made ground, which are required to have a definite grade, and in fact all general grading or leveling may easily and readily be done with this instrument by any one who understands the principle of a common carpenters level.

This instrument supplies a long felt necessity, and we believe it will become very popular, and we trust, profitable to the inventor.

The whole course of the Suez Canal, from the Mediterranean to the Red Sea is 100 miles. It has an average width of 328 feet, the width at the base is 246 feet, and the depth of water 26 feet. The distance from the English Channel to Calcutta, by way of the Cape of Good Hope, by the route taken by the best sailing vessels, is about 13,000 miles; by the Mediterranean and Suez Canal it is about 8000 miles—a gain in distance of 5000 miles. By the Cape route to Bombay the distance is 11,500 miles; by the Red Sea route 6,200 miles—a gain of 5,300 miles. The voyage from New York to Suez, including detentions at the usual places of call, can be made in sixteen days.

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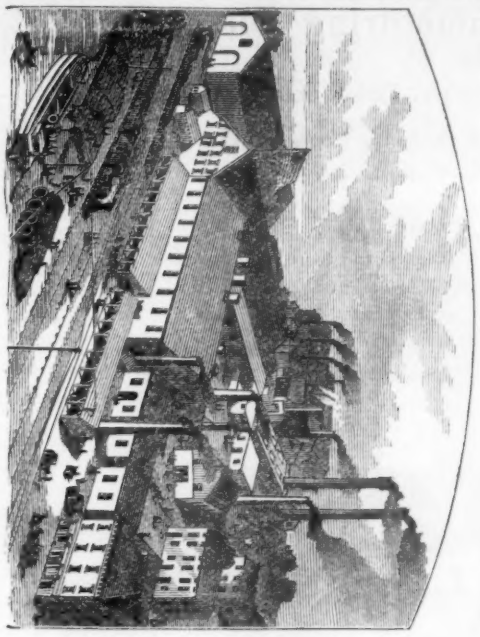

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With specific instructions how to successively manage the same, so as to obtain like results for six and twelve months more, thereby creating a great saving in capital and labor. Also, instructions how to burn your own Lime in a vacant oven.

Having 18 year's practical experience in Retort room, and management of Gas Works, I feel that I have attained that proficiency which will enable me to make the Work of great value to the profession.

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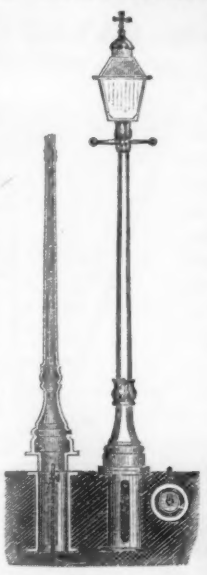
BRANSON'S PATENT LAMP POST.

THE ADVANTAGES OF THIS PATENT POST over the old style, are as follows:



1st. The saving of the base or bottom part of the Post, when the column is broken, the Post being made in two parts. The broken column can be replaced by a new one, without disturbing the base.

2d. When the old style of post is broken, the bottom piece has to be dug out, which cannot be done in winter, or in wet weather: all this is obviated in this Post, as no digging is required. This style of Pos is especially desirable when flag stone sidewalks are used.

3rd. When a stoppage of gas in stand pipe occurs, the column can be lifted out, the pipe detached, cleaned, and replaced in fifteen minutes; no digging being required as is now done with the old Post.

4th. A lighter and better casting can be made from this patent, and it can be handled better, owing to its length and lightness.

5th. In case a broken column cannot be repaired, one third of the original cost is saved by the base being secured and perfect.

Rights for States, or the United States, on reasonable terms. Address, Editors GAS-LIGHT JOURNAL, 22 Pine street, N. Y.

Certificate.

ST. LOUIS, September 1, 1869.

I have examined a new Lamp Post, the Branson patent, and unhesitatingly pronounce it to be the best thing of the kind I have ever seen. Posts of this description have been erected in this city, and in my opinion this style of Post should be universally adopted, as I believe it possesses all the advantages claimed for it.

The St. Louis Gas-Light Company have adapted this Post and ordered a large quantity for immediate use.

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100 lbs of the PECORA COMPANY'S COLORED PAINT (costing $12.50) will paint as much as 250 lbs. of Lead, and wear longer. For particulars, address S. BOWEN, Sec'y., No. 150 N. Fourth St., Philada.

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" Foreman of Boiler Department.

[Extract from testimony from Suprintendent Chelsea Gas Co., Mass.]

"We are much pleased with the Pecora Paint, it is just what Gas Company's want, it dries while the water is running down the holders; and we would not hesitate to have them settle immediately.

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The proposals, addressed to the undersigned, must be sealed and endorsed "Proposals for Coal Tar." They must state the offer for the Tar at a price for each ton of Coal carbonized at the Works of the Company. The quantity of Coal carbonized per annum is about 140,000 tons, and the average yield of Tar per ton of Coal is about 12 gallons. The Company do not bind themselves to accept the offer of the lowest, or any bidder.

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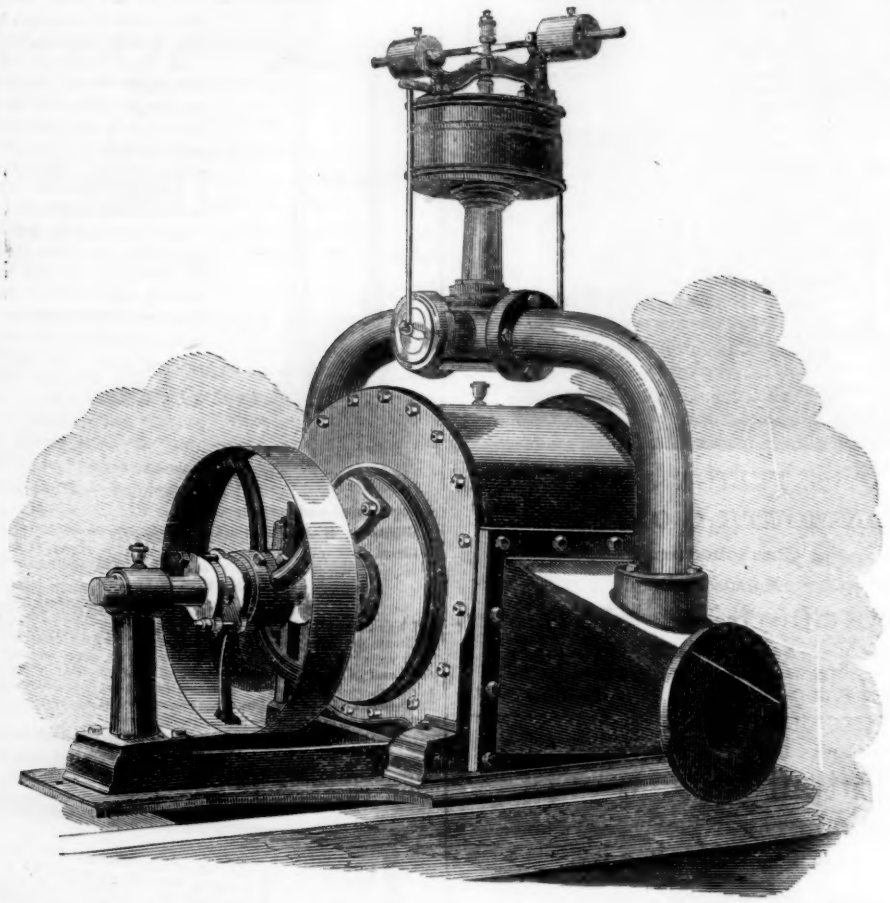
The Mackenzie Patent Gas Exhauster,
AND PATENT COMPENSATOR.



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

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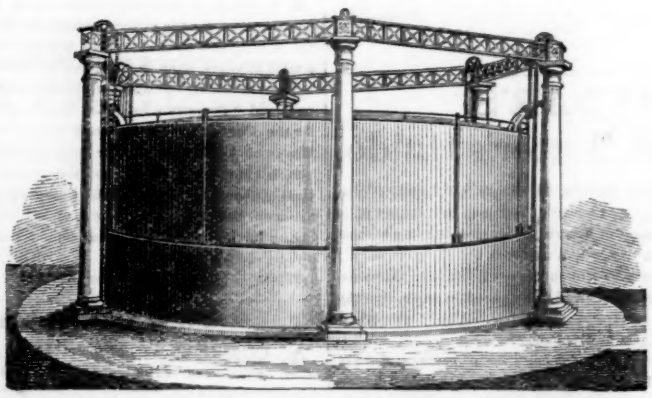

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FIG. 1.

Fig. 1 shows a single gate valve.

Fig. 2 represents wedge and one-half of gate of double valve, intended for larger sizes, when required to bear heavy pressure either side.

Fig. 3, represents a section through body, gate and wedge.

The slides, G G, are held against wedge D, by ribs, H H, projecting from sides of valve body, A.

In closing the valves, when opening I is covered, slides, G G, pass the lower ends of ribs, H H, when the wedge, D, can move forward on the inclined planes E E, and crowd the gates apart.

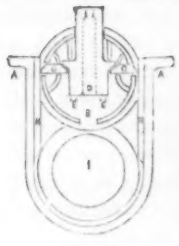

FIG. 3. FIG. 2.

[From A. F. Havens, Engineer Brooklyn Gas-Light Co.]

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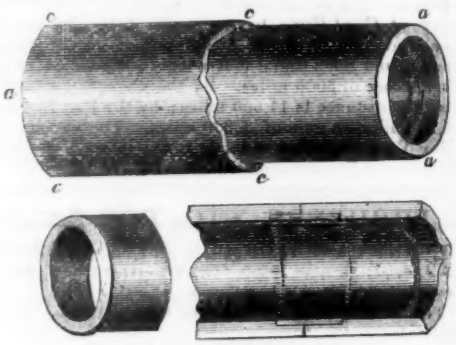

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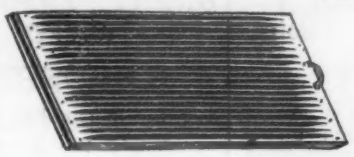

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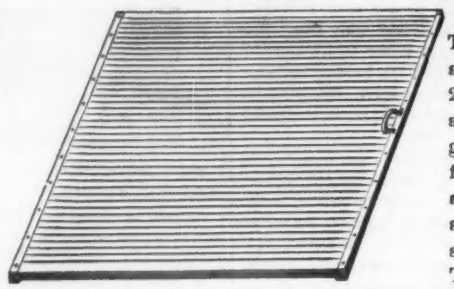

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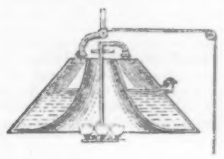

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PATENT LAMP POST.—THIS INVENTION relates to constructing Lamp Posts in two parts, viz. A base which is set in the ground, and a column or upper part which fits into the upper end of the base. By making Lamp Posts in this manner a great saving may be made in the original cost of the post, and in case the upper part of the post is broken, it is easily replaced by a new one, without the trouble and expense of digging up the old base, which frequently has to be delayed from inclemency of the weather. There is a collar around the upper end of the base, on which the base of the upper part rests. The sleeve has a number of lugs or chipping pieces projecting from its sides, which can, in a few minutes, be chipped off suffic ently to let the sleeve fit the base, no other tools being required but a hammer and chisel. In case the upper part of the post is broken so that it cannot be repaired the base is saved, which is one-third the cost of the post. In case the gas pipes become stopped by freezing or any other cause, the column can be lifted out from the base, the gas pipe (or stand-pipe) detached, the obstruction removed, and all put up in good order in the space of twenty or thirty minutes, which is a great advantage over the old posts. A cock can be put on the upper end of the bend of the gas pipe, and in case of breakage can be turned so as to shut off the gas. This is also no small item, and cannot be done with the old post. A stronger, lighter, and better casting can be made, and at the same time more sure to turn out better than the old posts.

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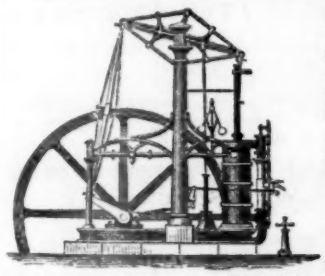

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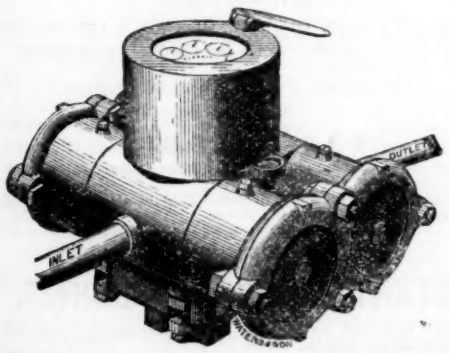

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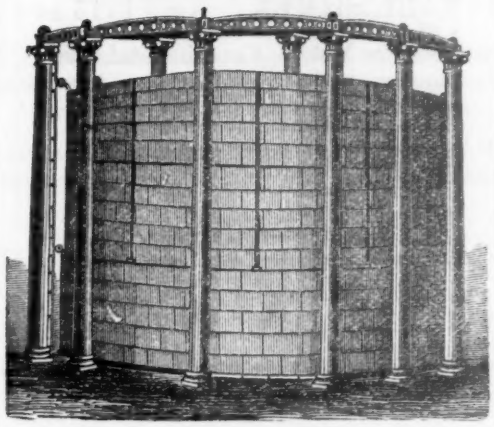

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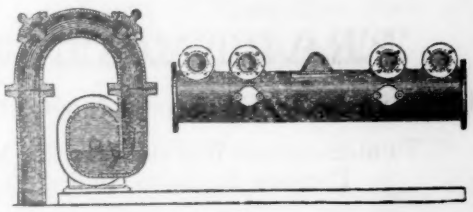

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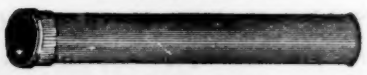

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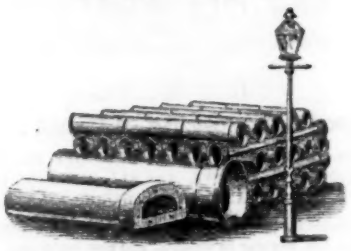

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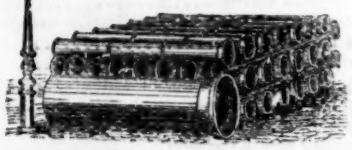

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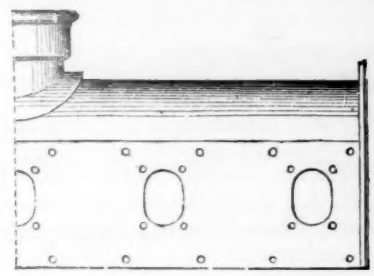

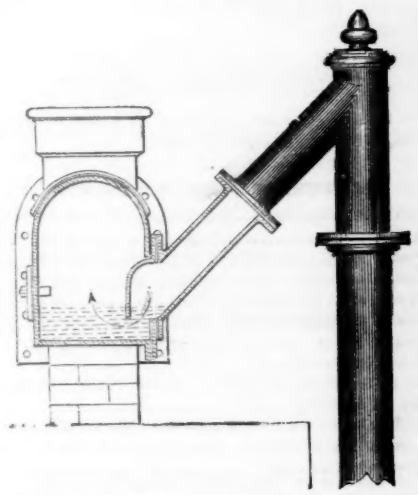

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